PROJECT NUMBER: 1702
PROJECT TITLE: Optical Processing and Aerosol Research
PROJECT LEADER: K. A. Cox
PERIOD COVERED: June, 1988

I. OPTICAL PACK INSPECTION, THEORETICAL (R. Maher, K. Cox)

A. **Objective**: Develop and test a discriminating filter for use in an optical and/or digital pack inspection system.

B. **Results**: Two filter algorithms and their variations were evaluated using a video library of images of both good packs and packs with the tear tape missing. The missing tear tape is considered a challenging defect to detect as it represents less than 2% of the image. All images were prealigned prior to testing. The following observations were made:

1. The SDF algorithm (developed in house) is capable of error free recognition of packs with missing tear tapes.

2. The algorithms tested work equally well on 8 bit gray scale or binary images.

3. Incorporating unacceptable images in the training set significantly improves the performance of the filter.

C. **Plans**: Test the most promising algorithms on a more extensive image library containing a variety of defects.

II. INDIVIDUAL CIGARETTE INSPECTION (D. Lowitz)

A. **Objective**: Develop methods for the inspection of individual cigarettes on a making machine.

B. **Results**: Improved stabilization was acheived for the simulated sample passing through the CIM 7401 rod monitor head on the CIM test table. A 1/3 mm black dot placed upon the surface of the sample can now be readily detected.

C. **Plans**: Develop the capability for data transfer from the CIM unit to a PC for data analysis.

In collaboration with Professor A. VanderLugt (consultant) and the QA department, establish defect bounds, and calculate primary design parameters for an individual cigarette monitoring system based on an acoustooptic scanner.

III. OPTICAL PACK INSPECTION, EXPERIMENTAL (C. Harward)

A. **Objective**: Evaluate the Global Holonetics SMART CAMERA (SC). Determine its effectiveness in discriminating between good and defective packs.

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B. **Results**: The results of the laboratory evaluation of prototype #2 were summarized in a memo from C. N. Harward. After training on sets of both good and defective packs, the unit correctly identified over 98% of the defecive packs while rejecting less than .5% of the good packs. The types of defects considered included misplaced closure stamp, missing closure stamp, and side-to-side label misalignment. The instrument was less successful in identifying packs having a blemish or a skewed closure stamp.

Evaluation of the SMART CAMERA in a simulated manufacturing environment (carried out in collaboration with Engineering) was temporarily halted due to a lack of stability in the instrument's output. The lack of stability has been attributed to an extreme sensitivity to room temperature. GHC is working on an improved unit which will incorporate an internal cooling system that will maintain the system temperature to within .2°F and permit adjustments to be made to the optics without opening the case. The new unit is expected in early July.

C. **Plans**: Complete the evaluation on a stable unit.

D. **References**: Harward, C. N., "Status of the Evaluation of the Global Holonetics Smart Camera," memo to K. A. Cox, June 10, 1988.

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